

Amendments to the Claims

Please amend claim 11, 59, 65, and 68-71 and cancel claim 73, as reflected in the following listing of claims.

Listing of Claims:

1. (Withdrawn) A method of forming a crystalline ribbon, the method comprising:
 providing a mesa crucible having a top surface and edges defining a boundary of the top surface of the mesa crucible;
 forming a melt of a source material on the top surface of the mesa crucible, edges of the melt retained by capillary attachment to the edges of the mesa crucible; and
 pulling a crystalline ribbon from the melt.
2. (Withdrawn) The method of claim 1, wherein the pulling step comprises:
 placing a seed in the melt;
 pulling the seed from the melt between a pair of strings positioned along the edges of the crystalline ribbon, thereby solidifying the melt between the pair of strings to form the crystalline ribbon; and
 continuously pulling the crystalline ribbon from the melt.
3. (Withdrawn) The method of claim 1, wherein at least a portion of a boundary profile of the melt is concave downward prior to the pulling step.
4. (Withdrawn) The method of claim 1, wherein at least a portion of a boundary profile of the melt is concave downward outside the region of the crystalline ribbon.
5. (Withdrawn) The method of claim 1, wherein pulling the crystalline ribbon from the melt forms an inflection point in a cross-sectional boundary profile of the melt.
6. (Withdrawn) The method of claim 1 further comprising forming a substantial portion of the

melt 1 above the edges of the mesa crucible.

7. (Withdrawn) The method of claim 1 further comprising forming more than one crystalline ribbon.

8. (Withdrawn) The method of claim 5, wherein the inflection point in at least a portion of the cross-sectional boundary profile of the melt predisposes the crystalline ribbon to grow substantially flat.

9. (Withdrawn) The method of claim 1 further comprising replenishing the source material on the top surface of the mesa crucible for continuous crystalline ribbon growth.

10. (Withdrawn) The method of claim 1 further comprising controlling the temperature of the mesa crucible while forming the crystalline ribbon.

11. (Currently Amended) An apparatus for forming a crystalline ribbon, comprising:

a crucible including:

a crucible body having a top surface supporting substantially all of a melt of a source material for forming the crystalline ribbon; ~~and~~

a pair of side walls extending downward from opposing edges of the top surface, the edges formed to retain substantially all of the melt by capillary attachment to the top surface of the crucible; and

a puller for drawing the crystalline ribbon from the melt and away from the crucible body and top surface thereof.

12. (Previously Presented) The apparatus of claim 11 further comprising:

a pair of apertures defined in the crucible body, extending from the top surface to a bottom surface through the crucible body; and

a pair of strings extending through the pair of apertures, each string positioned along an edge of the crystalline ribbon, the pair of strings defining a region within which a crystalline ribbon is formed.

13. (Previously Presented) The apparatus of claim 11, wherein the crucible adapts a portion of a boundary profile of the melt to be concave downward prior to forming a crystalline ribbon.

14. (Previously Presented) The apparatus of claim 11, wherein the crucible adapts a portion of a boundary profile of the melt to be concave downward outside the region of a crystalline ribbon.

15. (Original) The apparatus of claim 11, wherein pulling a crystalline ribbon from the melt forms an inflection point in a cross-sectional boundary profile of the melt.

16. (Previously Presented) The apparatus of claim 11, wherein a substantial portion of the melt is above the edges of the crucible.

17. (Previously Presented) The apparatus of claim 12, further comprising:
more than one pair of apertures defined in the crucible body, each pair extending from the top surface to a bottom surface through the crucible body; and
a pair of strings extending through each pair of apertures, each string positioned along an edge of a discrete crystalline ribbon, each pair of strings defining a region within which each discrete crystalline ribbon is formed.

18. (Previously Presented) The apparatus of claim 11, wherein the crucible comprises graphite.

19. (Previously Presented) The apparatus of claim 11, wherein the edges of the crucible define a recessed top surface of the crucible.

20. (Previously Presented) The apparatus of claim 11, wherein the width of the crucible is between about 15 mm and about 30 mm.

21. (Previously Presented) The apparatus of claim 11, further comprising means for replenishing the melt on the top surface of the crucible for continuous crystalline ribbon growth.
22. (Previously Presented) The apparatus of claim 11, further comprising means for controlling the temperature of the crucible while forming a crystalline ribbon.
23. (Withdrawn) A method of forming a crystalline ribbon, the method comprising:
 providing a crucible having a top surface and edges defining a boundary of the top surface of the crucible;
 forming a melt of a source material on the top surface of the crucible, the melt having a boundary profile at least a portion of which is concave downward; and
 pulling a crystalline ribbon from the melt.
24. (Withdrawn) The method of claim 23, wherein the pulling step comprises:
 placing a seed in the melt;
 pulling the seed from the melt between a pair of strings positioned along the edges of the crystalline ribbon, thereby solidifying the melt between the pair of strings to form the crystalline ribbon; and
 continuously pulling the crystalline ribbon from the melt.
25. (Withdrawn) The method of claim 23, wherein the portion of the boundary profile of the melt is concave downward prior to the pulling step.
26. (Withdrawn) The method of claim 23, wherein the portion of the boundary profile of the melt is concave downward outside the region of the crystalline ribbon.
27. (Withdrawn) The method of claim 23, wherein pulling the crystalline ribbon from the melt forms an inflection point in a cross-sectional boundary profile of the melt.

28. (Withdrawn) The method of claim 23 further comprising forming a substantial portion of the melt above the edges of the crucible.

29. (Withdrawn) The method of claim 23 further comprising forming more than one crystalline ribbon.

30. (Withdrawn) The method of claim 27, wherein the inflection point in at least a portion of the cross-sectional boundary profile of the melt predisposes the crystalline ribbon to grow substantially flat.

31. (Withdrawn) The method of claim 23 further comprising replenishing the source material on the top surface of the crucible for continuous crystalline ribbon growth.

32. (Withdrawn) The method of claim 23 further comprising controlling the temperature of the crucible while forming the crystalline ribbon.

33. (Withdrawn) The method of claim 23, wherein the width of the crucible is between about 15 mm and about 30 mm.

34. (Withdrawn) The method of claim 23, wherein the crucible is a mesa crucible.

35. (Withdrawn) A method of forming a crystalline ribbon, the method comprising:
 providing a crucible having a top surface and edges defining a boundary of the top surface of the crucible;
 forming a melt of a source material on the top surface of the crucible, the melt having a boundary profile; and
 pulling a crystalline ribbon from the melt, thereby forming an inflection point in at least a portion of a cross-sectional boundary profile of the melt.

36. (Withdrawn) The method of claim 35, wherein the pulling step comprises:
- placing a seed in the melt; and
 - pulling the seed from the melt between a pair of strings positioned along the edges of the crystalline ribbon, thereby solidifying the melt between the pair of strings to form the crystalline ribbon; and
 - continuously pulling the crystalline ribbon from the melt.
37. (Withdrawn) The method of claim 35, wherein a portion of the boundary profile of the melt is concave downward prior to the pulling step.
38. (Withdrawn) The method of claim 35, wherein a portion of the boundary profile of the melt is concave downward outside the region of the crystalline ribbon.
39. (Withdrawn) The method of claim 35 further comprising forming a substantial portion of the melt above the edges of the crucible.
40. (Withdrawn) The method of claim 35 further comprising forming more than one crystalline ribbon.
41. (Withdrawn) The method of claim 35, wherein the inflection point in at least a portion of the cross-sectional boundary profile of the melt predisposes the crystalline ribbon to grow substantially flat.
42. (Withdrawn) The method of claim 35 further comprising replenishing the source material on the top surface of the crucible for continuous crystalline ribbon growth
43. (Withdrawn) The method of claim 35 further comprising controlling the temperature of the crucible while forming the crystalline ribbon.

44. (Withdrawn) The method of claim 35, wherein the width of the crucible is between about 15 mm and about 30 mm.

45. (Withdrawn) The method of claim 35, wherein the crucible is a mesa crucible.

46. (Withdrawn) A method of forming a crystalline ribbon, the method comprising:
providing a crucible having a top surface and edges defining a boundary of the top surface of the crucible;
forming a melt of a source material on the top surface of the crucible, a substantial portion of the melt above the edges of the crucible; and
pulling a crystalline ribbon from the melt.

47. (Withdrawn) The method of claim 46, wherein the pulling step comprises:
placing a seed in the melt; and
pulling the seed from the melt between a pair of strings positioned along the edges of the crystalline ribbon, thereby solidifying the melt between the pair of strings to form the crystalline ribbon; and
continuously pulling the crystalline ribbon from the melt.

48. (Withdrawn) The method of claim 46, wherein a portion of a boundary profile of the melt is concave downward prior to the pulling step.

49. (Withdrawn) The method of claim 46, wherein a portion of a boundary profile of the melt is concave downward outside the region of the crystalline ribbon.

50. (Withdrawn) The method of claim 46 wherein pulling the crystalline ribbon from the melt forms an inflection point in a cross-sectional boundary profile of the melt.

51. (Withdrawn) The method of claim 46 further comprising forming more than one crystalline ribbon.

52. (Withdrawn) The method of claim 50, wherein the inflection point in at least a portion of the cross-sectional boundary profile of the melt predisposes the crystalline ribbon to grow substantially flat.

53. (Withdrawn) The method of claim 46 further comprising replenishing the source material on the top surface of the crucible for continuous crystalline ribbon growth.

54. (Withdrawn) The method of claim 46 further comprising controlling the temperature of the crucible while forming the crystalline ribbon.

55. (Withdrawn) The method of claim 46, wherein the width of the crucible is between about 15 mm and about 30 mm.

56. (Withdrawn) The method of claim 46, wherein the crucible is a mesa crucible.

57. (Withdrawn) A method of controlling temperature of a mesa crucible while forming a crystalline ribbon, the method comprising:

- positioning an insulator comprising movable elements along a mesa crucible;
- disposing the mesa crucible in a furnace; and
- creating controlled heat leaks by moving the moveable elements of the insulator relative to the mesa crucible.

58. (Withdrawn) The method of claim 57, wherein rods connected to the moveable elements penetrate the furnace and are controlled from outside the furnace.

59. (Currently Amended) An apparatus for controlling temperature of a crucible while forming a crystalline ribbon, the apparatus comprising:

- a crucible disposed within a furnace, the crucible including:

a crucible body having a top surface supporting substantially all of a melt of a source material for forming the crystalline ribbon, and
a pair of side walls extending downward from opposing edges of the top surface, the edges formed to retain substantially all of the melt by capillary attachment to the top surface of the crucible;
a puller for drawing the crystalline ribbon from the melt and away from the crucible body and top surface thereof;
an insulator comprising movable elements disposed along the crucible; and
means for moving the moveable elements of the insulator relative to the crucible to create controlled heats leaks from the furnace.

60. (Withdrawn) A method of replenishing a melt of a source material on a mesa crucible, the method comprising distributing a source material onto a mesa crucible, thereby reducing the heat load required to melt the source material.

61. (Withdrawn) The method of claim 60, wherein the distributing step comprises:

positioning a feeder at a distance from a mesa crucible;
moving a feeder in a first direction and a second direction along a mesa crucible; and
vibrating the feeder during motion in at least one of the first direction and the second direction, such that a source material disposed within the feeder enters a melt on the mesa crucible during such motion.

62. (Withdrawn) The method of claim 61, further comprising melting the source material prior to source material from a subsequent motion in the first direction reaching the melt.

63. (Withdrawn) The method of claim 61, wherein the distance from the mesa crucible is less than the width of the mesa crucible.

64. (Cancelled).

65. (Currently Amended) An apparatus for replenishing a melt of a source material on a crucible, the apparatus comprising:

- a crucible body having a top surface supporting substantially all of a melt of a source material for forming the crystalline ribbon; and
- a pair of side walls extending downward from opposing edges of the top surface, the edges formed to retain substantially all of the melt by capillary attachment to the top surface of the crucible;
- a puller for drawing the crystalline ribbon from the melt and away from the crucible body and top surface thereof;
- a feeder positioned at a distance from the crucible, the feeder movable in a first direction and a second direction along the crucible; and
- means for vibrating the feeder during motion in at least one of the first direction and the second direction, such that a source material disposed within the feeder enters the melt during such motion.

66. (Original) The apparatus of claim 65, wherein the feeder comprises a tube for delivering the source material to the melt.

67. (Previously Presented) The apparatus of claim 65, wherein the distance from the crucible is less than the width of the crucible.

68. (Currently Amended) An apparatus for forming a crystalline ribbon, the apparatus comprising:

- a crucible for retaining a melt having a boundary profile, the crucible having:
 - a top surface supporting substantially all of the melt of the source material for forming a crystalline ribbon; and
 - a pair of side walls extending downward from opposing edges of the top surface, the edges formed to retain substantially all of the melt by capillary attachment to the top surface of the crucible; and

a puller for drawing means for pulling the crystalline ribbon from the melt and away from the crucible body and top surface thereof, wherein at least a portion of the boundary profile is concave downward.

69. (Currently Amended) An apparatus for forming a crystalline ribbon, the apparatus comprising:

a crucible for retaining a melt having a boundary profile, the crucible having:

- a top surface supporting substantially all of the melt of the source material for forming a crystalline ribbon; and
- a pair of side walls extending downward from opposing edges of the top surface, the edges formed to retain substantially all of the melt by capillary attachment to the top surface of the crucible; and
- a puller for drawing means for pulling the crystalline ribbon from the melt and away from the crucible body and top surface thereof, thereby forming an inflection point in at least a portion of a cross-sectional boundary profile of the melt.

70. (Currently Amended) An apparatus for forming a crystalline ribbon, the apparatus comprising:

- a top surface supporting substantially all of the melt of the source material for forming a crystalline ribbon: and
- a pair of side walls extending downward from opposing edges of the top surface, the edges formed to retain substantially all of the melt by capillary attachment to the top surface of the crucible; and
- a puller for drawing means for pulling the crystalline ribbon from the melt and away from the crucible body and top surface thereof, wherein a substantial portion of the melt is above the edges of the crucible.

71. (Currently Amended) A crucible comprising:

a crucible body having a top surface supporting substantially all of a melt of a source material for forming a crystalline ribbon; and
a pair of side walls extending downward from opposing edges of the top surface, the edges formed to retain substantially all of the melt by capillary attachment to the top surface of the crucible; and
means for pulling the crystalline ribbon from the melt and away from the crucible body and top surface thereof.

72. (Previously Presented) The apparatus of claim 71 further comprising a pair of apertures defined in the crucible body, each aperture extending from the top surface to a bottom surface through the crucible body, each aperture capable of receiving a string for forming an edge of the crystalline ribbon.

73. (Cancelled)

74. (Previously Presented) The apparatus of claim 11 wherein the top surface is substantially flat.